

2025

KAKENHI

GRANTS-IN-AID FOR SCIENTIFIC RESEARCH

Creating New Knowledge

—For Shaping and Transmitting World-leading Knowledge Assets



MEXT

MINISTRY OF EDUCATION,
CULTURE, SPORTS,
SCIENCE AND TECHNOLOGY-JAPAN



JSPS

JAPAN SOCIETY FOR THE PROMOTION OF SCIENCE
日本学術振興会



What is the Grants-in-Aid for Scientific Research (KAKENHI) program?	2
Research Categories	3
Grant Applications	5
Review	8
Assessment Following the Adoption of Research Projects	10
Research Results of KAKENHI-funded Projects	11
 Supplementary Material and Data	 15
Management of the KAKENHI System	15
Application/Adoption Numbers and Annual Budgets	16
Review Sections	18
Selection of Reviewers(in the case of Scientific Research category)	19
Disclosure of Review Results	20
Aiming for easy-to-use research grants	21
Initiatives for Ensuring Appropriate Use of KAKENHI Funds and Fair Research Activities	24
Public Release of Research Results	26
Information Dissemination and Public Relations Activities	28

*This booklet has been produced based on information as of July 2025, unless otherwise specified.

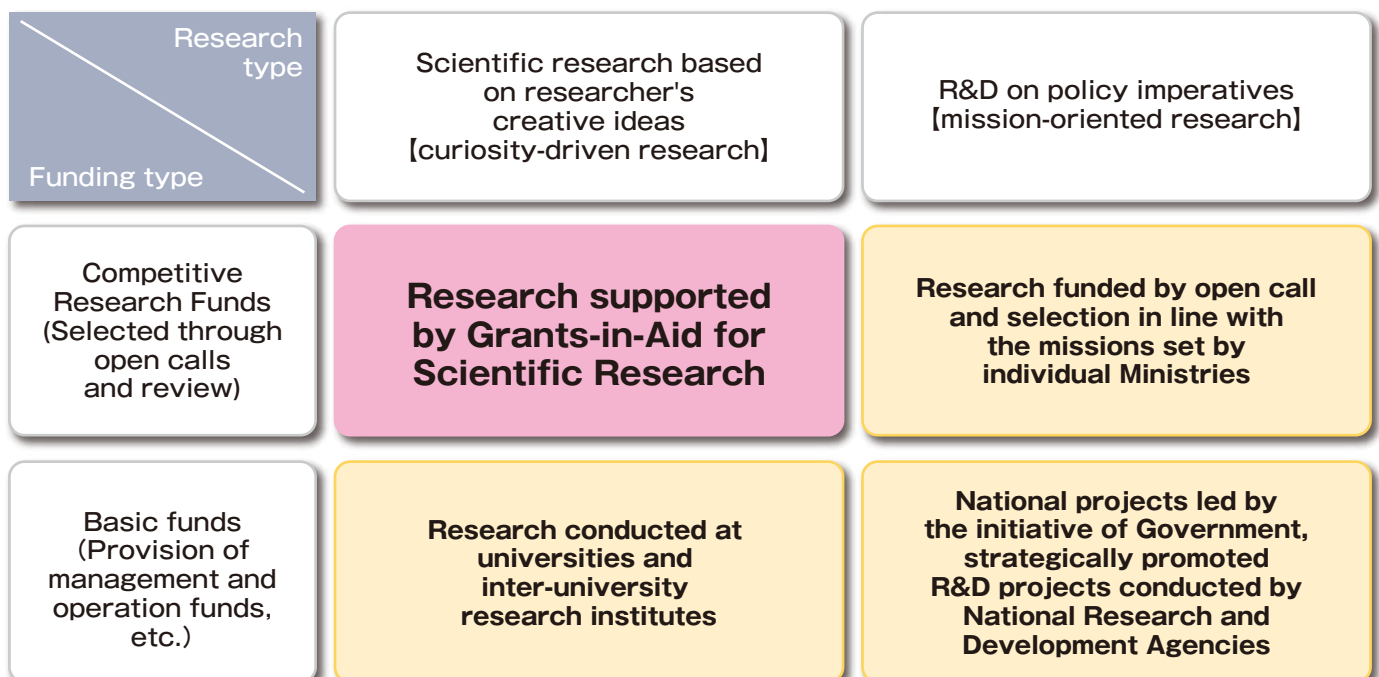
What is the Grants-in-Aid for Scientific Research (KAKENHI) program?

Universities and research institutions across Japan conduct many different kinds of research. As one means of supporting the research, the Grants-in-Aid for Scientific Research (KAKENHI) program supports scientific research across all fields from the humanities and social sciences to the natural sciences and across the spectrum from basic to applied research. The budget for fiscal 2025 is approximately 237.9 billion yen. In fiscal 2024, KAKENHI supported approximately 80,000 outstanding research projects, including newly adopted proposals and ongoing research projects that have already been adopted. These features make KAKENHI the largest competitive research funds in Japan.

Research activities take many forms, including those in which the researchers carry out their work with curiosity, projects in which the area of concentration and goals are defined in advance, and those intended to lead to specific product development. The starting point for all these activities is scientific research based on the researcher's creative ideas. By broadly supporting this scientific research, which is the foundation of all research activities, the KAKENHI program plays a major role, in the fostering and development of scientific advances.

KAKENHI provides funds necessary for research activities, following adoption based on the rigorous review of research plans submitted by researchers.

■ The placement of “KAKENHI” in the policy on the promotion of science, technology and scientific research in Japan



Research Categories

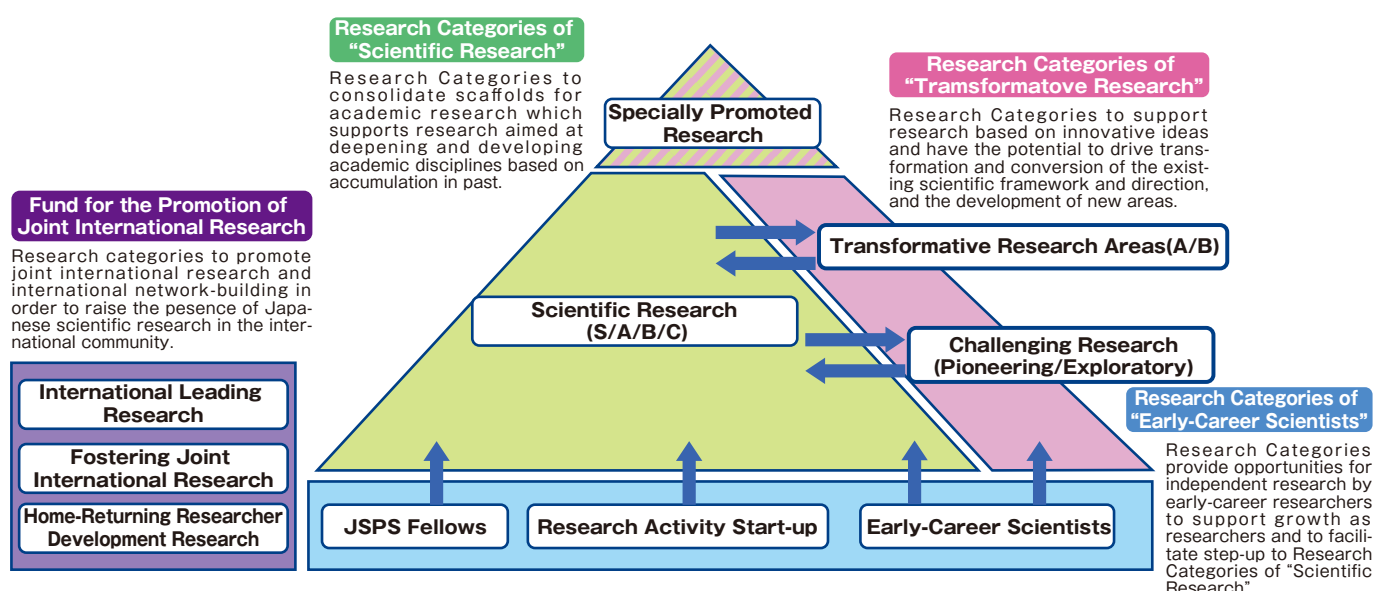
KAKENHI covers all fields of research.

This scheme offers a variety of research categories, depending on the contents and scale.

KAKENHI supports all types of curiosity-driven research (i.e. scientific research based on researcher's creative ideas) from basic research to applied research, covering all fields, from the humanities and social sciences to natural sciences.

Research categories are defined based on the stage and scale of the research. Researchers applying for KAKENHI can select a research category based on the contents and scale of their own research plan.

Image of research categories in FY2025



Details on each research category are as follows.

As of July 2025

Research categories	Purposes and description of each research category	Type of fund ^{*1}
Grants-in-Aid for Scientific Research		
Grant-in-Aid for Specially Promoted Research	Outstanding and distinctive research conducted by one or a relatively small number of researchers expected to achieve remarkably excellent research results that opens up a new scientific field. The research period is 3 to 5 years. (In a truly necessary case, period up to 7 years is acceptable.) The budget ranges from 200 million to 500 million yen per project (Only in a truly necessary case, budget exceeding 500 million yen is asked for.).	SG
Grant-in-Aid for Transformative Research Areas	(A) Research areas proposed through co-creative and interdisciplinary efforts of diverse researchers, which aim to create research areas that will lead the way to radical transformation of and change in the existing framework and/or direction of research as well as upgrade and level-up of scientific research in Japan and nurturing young researchers, and will contribute to the development of the proposed research areas through efforts for joint research and shared use of equipment, etc. (5 years; more than 50 million yen and up to 300 million yen per fiscal year per research area (In a truly necessary case, a budget exceeding 300 million yen may be requested.)) (B) Research areas proposed by compact groups of researchers who will be bearers of the next generation of research with a smaller budget scale (about 3 or 4 groups), which aim to create research areas that will lead the way to radical transformation of and change in the existing framework and/or direction of research as well as upgrade and level-up of scientific research in Japan through more challenging and exploratory research, and expected to lead to the Transformative Research Areas (A) in the future. (3 years; 50 million yen or less per fiscal year per research area)	SG

Research categories	Purposes and description of each research category	Type of fund*1	
Grants-in-Aid for Scientific Research			
Grant-in-Aid for Scientific Research	(S): Creative/pioneering research conducted by one or a relatively small number of researchers. 5 years (in principle) 50 million to 200 million yen (A), (B), (C): Creative/pioneering research conducted by one researcher or jointly by multiple researchers. (A) 3 to 5 years; 20 million to 50 million yen (B) 3 to 5 years; 5 million to 20 million yen (C) 3 to 5 years; 5 million yen or less	(S)	SG
		(A)	
		(B)	MF
		(C)	
Grant-in-Aid for Challenging Research	Research conducted by a single or multiple researchers that aims at radically transforming the existing research framework and/or changing the research direction and has a potential of rapid development. The scope of the (Exploratory) category encompasses research proposals that are highly exploratory and/or are in their budding stages. (Pioneering) 3 to 6 years; 5 million to 20 million yen (Exploratory) 2 to 3 years; 5 million yen or less	MF	
Grant-in-Aid for Early-Career Scientists	Research conducted by an individual researcher (*2) who is less than 8 years after Ph.D. acquisition. 2 to 5 years; 5 million yen or less.	MF	
Grant-in-Aid for Research Activity Start-up	Research conducted by a single researcher who has been newly hired by a research institution, or who has returned from his/her childcare leave, etc. or from the nursing of his/her preschool child(ren). 1 to 2 years; 3 million yen or less (1.5 million yen or less if the research period is 1 year.)	MF	
Grant-in-Aid for Encouragement of Scientists	Research conducted by an individual who is ineligible for application for other KAKENHI categories (e.g., Individuals who belong to educational or research institutions, private companies, etc. and engage in the researches to contribute to the promotion of the science). 1 year; 100 thousand to 1 million yen	SG	
Grant-in-Aid for Special Purposes	Research projects of pressing urgency and importance	MF	
Grant-in-Aid for Publication of Scientific Research Results			
Publication of Research Results	Subsidy for publication and/or international dissemination of research achievements of high academic values executed by academic associations and other organizations.	SG	
Enhancement of International Dissemination of Information	Subsidy for efforts by academic societies and other scholarly organizations to strengthen international dissemination of academic information for the purpose of international academic exchange.		
Scientific Literature	Subsidy for academic publication of research results (books) authored by an individual or a group of researchers.		
Databases	Subsidy for creation and operation of a database open to public use by an individual or a group of researchers.		
Grant-in-Aid for JSPS Fellows	Funding period is up to 3 years for research conducted by JSPS Fellows (including JSPS International Research Fellow). As for Cross-border Postdoctoral Fellowship (CPD) the period is up to 5 years	MF	
Fund for the Promotion of Joint International Research			
International Leading Research	This grant aims to enable research groups led by top-level researchers in our country to play a central role in the international network, thereby achieving research results of high scientific value internationally. With the participation of postdoctoral fellows and graduate students, the grant seeks to foster researchers who can play leading roles in the international research community in the future. (7 years (extendable up to 10 years); up to 500 million yen)	MF	
Fostering Joint International Research	Support of joint international research project conducted by a KAKENHI grantee in collaboration with researcher(s) at a foreign university or a research institution over a period of 6 to 12 months. The grant seeks to markedly advance research plans for the root research project and to foster independent researchers who can be internationally competitive. (The budget is up to 12 million yen.)		
Home-Returning Researcher Development Research	Support of research to be conducted by a Japanese researcher with current affiliation abroad who is to be newly appointed at university or research institution in Japan. (The period is up to 3 years. The budget is up to 50 million yen.)		

(*) SG: Series of Single-year Grants, MF: Multi-year Fund

(*) Including those who are expected to acquire their Ph.D. and those deemed less than eight years after the acquisition of their Ph.D. by exempting the period of maternity leave or the period of raising preschooler(s) following their Ph.D. acquisition.

Grant Applications

You may apply for KAKENHI grants if you meet the eligibility for KAKENHI application.

Researchers who meet the eligibility for KAKENHI application may apply for KAKENHI grants. Not only researchers at universities, but also researchers at research institutes of private corporations or other organizations designated by the MEXT Minister may apply for KAKENHI grants.

Any researcher considering applying is kindly requested to check with their research institution for specific procedures.

Under the KAKENHI, the schedule is set up in order to enable research projects to commence from April, the beginning of the fiscal year. Accordingly, a series of calls for proposals start in April or later of the previous year, and after a review process, a notice of review results is sent promptly to each research institution by the end of the previous fiscal year.

Application Procedures for KAKENHI and relevant documents, including the Research Proposal Document, which forms part of the application documents, are available on the respective KAKENHI websites of MEXT and JSPS. English versions of the Application Procedures and the Research Proposal Document forms are available, and applications may be submitted in English.

Applications are accepted online through the electronic application system.

Application Procedures (JSPS)
<https://www.jsps.go.jp/english/e-grants/howtoapply.html>

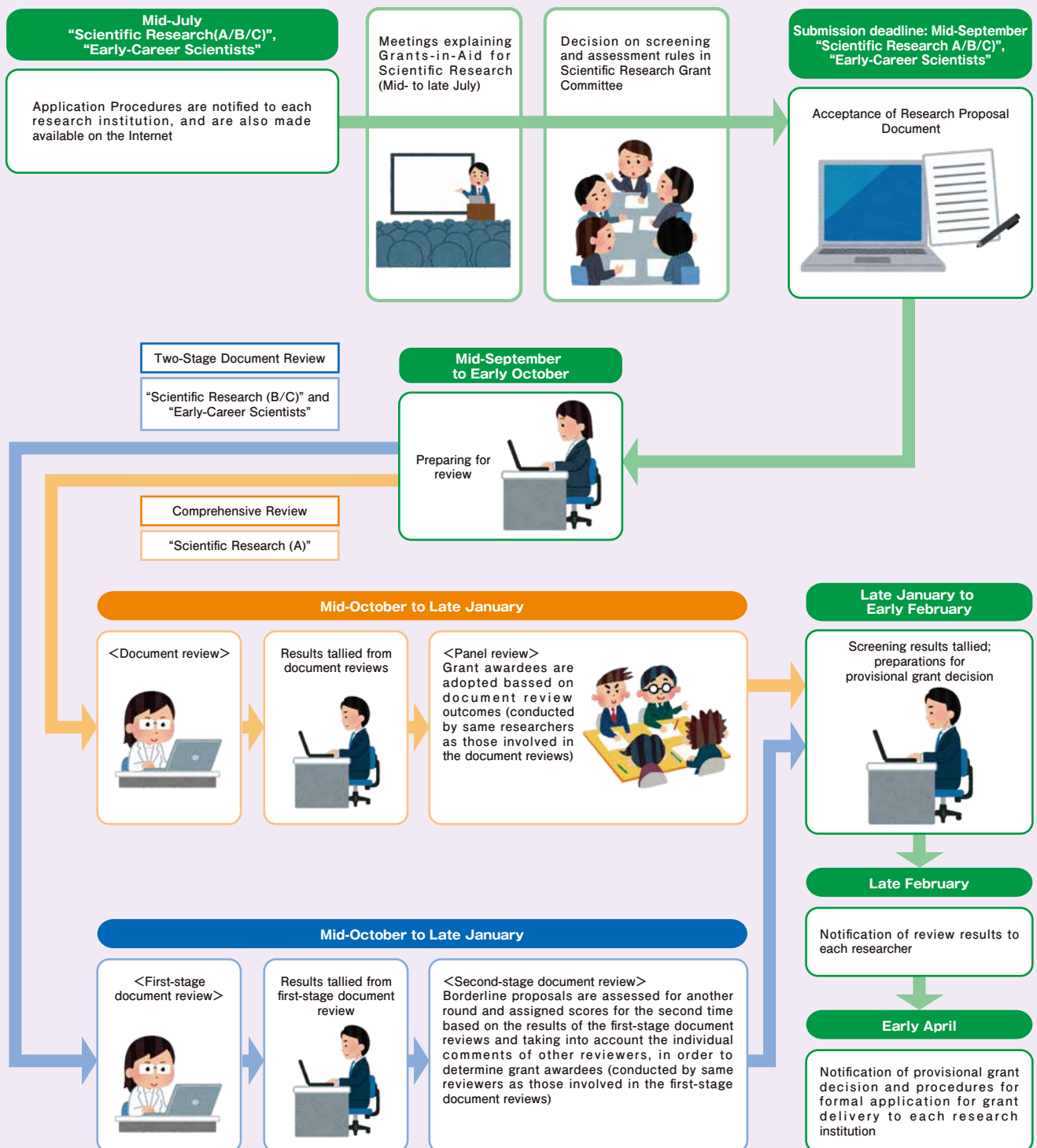


Application Procedures (MEXT) (Japanese version only)
https://www.mext.go.jp/a_menu/shinkou/hojyo/boshu/1351544.htm



Flow from Call for Proposals to Provisional Grant Decision

The diagram below describes the flow from call for proposals to provisional grant decision in the 2026 funding year in the case of the most common research categories, “Scientific Research (A/B/C)” and “Early-Career Scientists”.



■Year-round schedule of KAKENHI process

Schedule for FY2026 Call for Proposals and Notice of Review Results for Main Research Categories

	2025										2026					
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	
Specially Promoted Research	Call for proposal → Review										● Notice of Review Results					
Scientific Research (S)	Call for proposal → Review										● Notice of Review Results					
Transformative Research Areas (A/B)	Call for proposal → Review										● Notice of Review Results					
Transformative Research Areas (A) (Publicly Offered Research) Scientific Research (A/B/C), Early-Career Scientists				Call for proposal → Review										● Notice of Review Results		
Encouragement of Scientists				Call for proposal → Review										● Notice of Review Results		
Challenging Research (Pioneering/Exploratory)				Call for proposal → Review										Notice of Review Results		●
Publication of Scientific Research Results				Call for proposal → Review										● Notice of Review Results		

Schedule for FY2025 Call for Proposals and Notice of Review Results for Main Research Categories

	2025										2026					
	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	
Fostering Joint International Research Home-Returning Researcher Development Research				Call for proposal → Review										● Notice of Review Results		

For the timeline for research categories not listed above, please refer to the respective Application Procedures and other documents.

Review

Researchers serve as reviewers to support a fair and highly transparent review system.

A peer review* process is carried out in order to select high quality research projects.

*A system in which researchers selected by the scientific community itself mutually evaluate and review the academic value of each research project according to their conscience as scientists.

More than 8,000 researchers participate in the review of KAKENHI annually as reviewers. A fair and highly transparent review is ensured by such measures as not allowing anyone to review research proposals submitted by interested parties or to divulge any information obtained during the review process, disclosing the results of review to the applicants, and publishing the list of the reviewers who conducted the review (*).

* Date of publication: The fiscal year in which the term of office of all the reviewers who reviewed the research proposals for the year of the call for proposals expires

* Place of publication: Website of JSPS (List of Reviewers | Grants-in-Aid for Scientific Research | Japan Society for the Promotion of Science (jspm.go.jp))

In addition, since it is necessary to conduct a fair review at all times, the Research Center for Science Systems (P15) within JSPS conducts the selection of reviewers. It also verifies and analyzes whether or not there is a profit inducement and the status of the review based on the review regulations (rules). (It is not involved in the review itself, such as deciding on the adopted research projects.)

Details of the selection of the reviewers, as well as the policies and standards for the review, can be found on the websites of MEXT and JSPS. [References: Selection of Reviewers P19][Standards of Review (website of KAKENHI)]

Review Sections are established for review, and applicants choose their own Review Section for application.

"Review methods include "Two-Stage Document Review" and "Comprehensive Review."

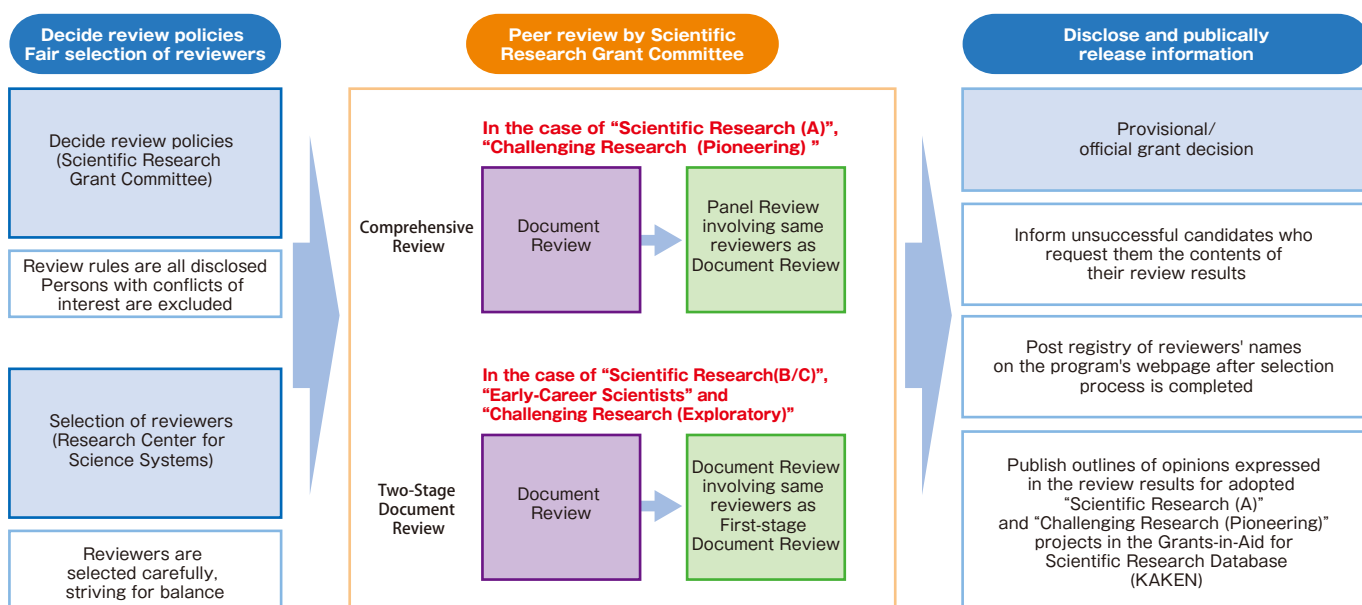
In the "Two-Stage Document Review," the same reviewers conduct document reviews in two stages and determine adoption.

In the "Comprehensive Review," adoption is determined pursuant to a document review followed by a multi-faceted review by a panel composed of the same reviewers who conducted the document review.

Review Criteria (KAKENHI website)
<https://www.jsps.go.jp/english/e-grants/grants03.html>



KAKENHI Review Methods —A Fair, Impartial and Transparent Review Process



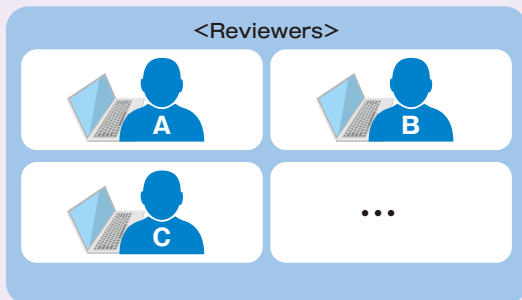
■ Review Process

■ [Two-Stage Document Review] (Examples)— “Scientific Research (B/C)”, “Early-Career Scientists” and “Challenging Research (Exploratory)” —

Each “Scientific Research (B)” proposal is reviewed by five reviewers*¹; each “Scientific Research (C)” and “Early-Career Scientists” proposal is reviewed by three reviewers; each “Challenging Research (Exploratory)” proposal is reviewed by seven to eight reviewers. In the event that the number of proposals received is large, reviews are conducted following a preliminary screening (in the Challenging Research category only).

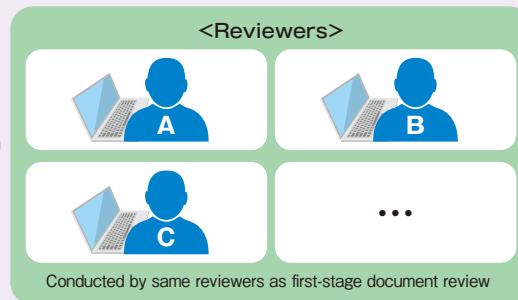
First-stage Document Review (in each Basic Section*^{1,2})

Each proposal undergoes a document review (relative evaluation) via the electronic application system, conducted by multiple reviewers appointed in the applicable Basic Section*^{1,2}



Second-stage Document Review (in each Basic Section*^{1,2})

Proposals mainly close to the borderline are awarded scores for the second time based on the results of the first-stage document reviews and taking into account the individual comments of other reviewers



*1 For Grant-in-Aid for Scientific Research (B), joint reviews will be conducted by consolidating several Basic Sections for which the number of applications is notably small. Joint reviews will be conducted by five to ten reviewers.

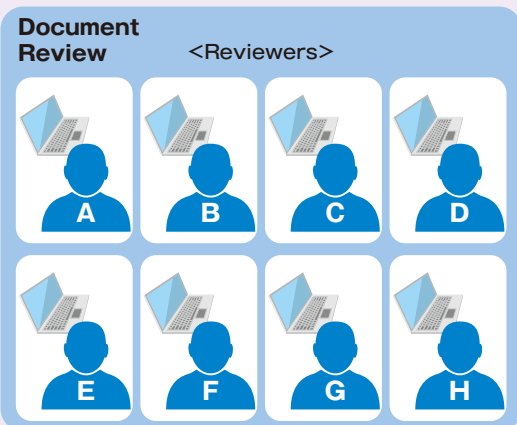
*2 For “Challenging Research (Exploratory)”, reviews are conducted in each Medium-sized Section.

■ [Comprehensive Review] (Examples)— “Scientific Research (A)”, and “Challenging Research (Pioneering)” —

Between seven and eight reviewers are appointed for each proposal in the “Scientific Research (A)” and “Challenging Research (Pioneering)”, and each proposal is subject to both a document review and a more thorough and multi-faceted panel review. In the event that a large number of applications is received, the review may include processes such as preliminary screening (“Challenging Research” only) or random assignment*³ of research proposals.

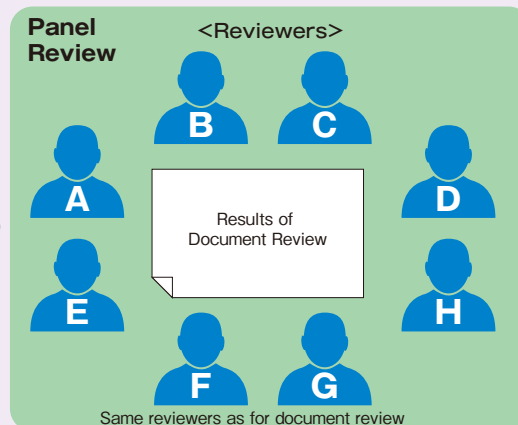
Document review (in Medium-sized Section)

The document review (relative evaluation) for each research project is conducted by multiple reviewers assigned (for each Medium-sized Section) across a broader range of disciplines.



Panel review (in Medium-sized Section)

Based on the cumulative results of the document review, a panel made up of the same reviewers who conducted the document review will carry out a multi-faceted review, and decide to adopt or not the application.



*3 In order to alleviate the burden on reviewers in sections with large numbers of applications, multiple review groups are established and proposals assigned to them randomly.

*4 For such as “Scientific Research (S)”, in addition to the Comprehensive Review, we have introduced a system of review comments produced by researchers in closely-related specializations, taking into account the specialized nature of applications.

References and Data	Review Sections	P18
	Selection of Reviewers	P19
	Disclosure of Review Results	P20

Assessment Following the Adoption of Research Projects

We conduct assessments after adoption based on the size and progress of the research.

Research funded by KAKENHI undergoes regular assessment by the scientific community, such as when the research results are published as academic papers. A research funding organization, however, also has a crucial role in properly assessing the results of KAKENHI-funded research. For researchers, as well, third-party assessment in addition to self-assessment is useful as a basis for reviewing research conducted up to now or for leading to development into new research.

For these reasons, the KAKENHI program, based on the “General Guidelines for Evaluating Government Funded R&D”, carries out assessment in certain categories (*) in keeping with the scope and progress stage of research, and makes public all the assessment results on the KAKENHI website and elsewhere.

Please note that, depending on the progress of the research, reduction or termination of research expenses may be considered as a result of the evaluation.

* The assessment is conducted, in principle, in the interim fiscal year and the fiscal year following the final year of the research period for Specially Promoted Research, Scientific Research on Innovative Areas, Transformative Research Areas (A), and Scientific Research (S), and in the third year of the grant period for Enhancement of International Dissemination of Information.

Research Results of KAKENHI-funded Projects

KAKENHI-funded research projects have produced a wide variety of results, ranging from basic research to those that play a role in our daily lives.

Introducing Research Achievements Resulting



Development of cancer immunotherapy using PD-1 blockade

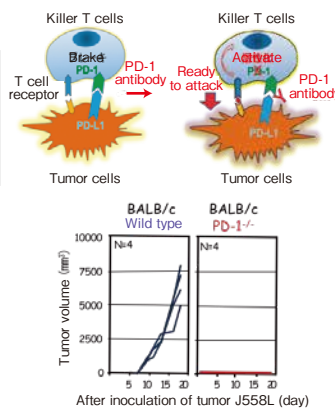
HONJO Tasuku, Distinguished Professor,
Kyoto University

In 1992, Professor HONJO newly identified programmed cell death 1 (PD-1), a T cell surface molecule related to T-cell selection in the thymus gland. The function of PD-1 within the body remained unknown.

Research Outcome

- In 1999, showed in experiments using laboratory mice lacking PD-1 that PD-1 is an inhibitor molecule, acting as a brake on excessive immune reactions.
- Showed that in mice lacking PD-1 there was no brake applied to immune function and this led to auto-immune disease.

- In 2002, proved in laboratory experiments with mice lacking PD-1 or PD-1 blockade that blocking PD-1 can activate killer T cells and thereby inhibit the growth of cancer: a world-first achievement.



KAKENHI financial support

Mechanism of lymphocyte differentiation, molecular mechanisms of gene rearrangement and clonal deletion by antigens (Grant-in-Aid for Specially Promoted Research, 1992-1994) etc.

Funding by KAKENHI began in the early 1990s

Further developments from research achievements

- Created a human antibody for human PD-1 and conducted clinical trials with Bristol-Myers Squibb and Ono Pharmaceutical. The therapy was effective even in around 30% of stage-4 cancer patients who had no other treatment options remaining.
- Today, this therapy is applied to many types of cancer and used on patients throughout the world.
- Professor HONJO continues to pursue research on causes of non-effective therapy, concomitant therapies to strengthen therapeutic effects, and methods of reducing side-effects.



Professor HONJO was awarded the Nobel Prize in Physiology or Medicine in 2018 for "discovery of cancer therapy by inhibition of negative immune regulation."

© Nobel Media AB The Nobel prize Medal is a registered trademark of the Nobel Foundation



Research on Neutrino Oscillations

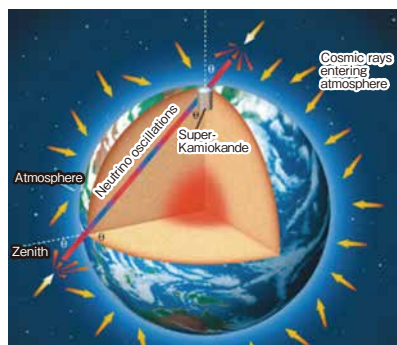
KAJITA Takaaki, Director, Professor,
The University of Tokyo

- Neutrinos are elementary particles, of which there are three "flavors"—electron neutrinos, muon neutrinos, and tau neutrinos. Being extremely light, for a long time they were believed to have zero mass.
- Based on the observation that the ratio of the electron neutrino and muon neutrino components of the Kamiokande experiment's atmospheric neutrino data did not agree with expectations, the issue of the "atmospheric neutrino anomaly" was raised. Then the study on atmospheric neutrinos which produced when cosmic rays collide with atoms in the atmosphere was begun.

Research Outcome

- Observations of atmospheric neutrinos using Super-Kamiokande revealed that of muon neutrinos produced on the other side of the Earth, some changed to tau neutrinos as a result of their long journey. Their number was only about half the number of neutrinos that came down from directly above the detector.

- This phenomenon came to be known as neutrino oscillation, neutrinos changing into other types of neutrinos while in flight. This occurs only if neutrinos have mass. The discovery of neutrino oscillations became definitive proof that neutrinos have a mass that is not zero.



Atmospheric neutrinos produced in the atmosphere on the other side of the Earth pass through the Earth and arrive at the detector.

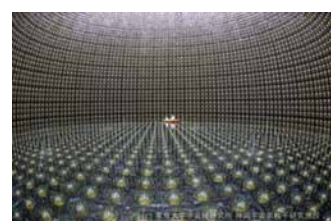
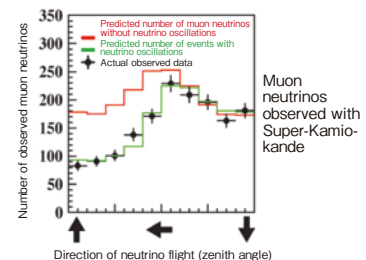
Further developments from research achievements

- Since this discovery, studies of neutrino mass and of elementary particle theory incorporating these findings have progressed, leading to the confirmation of oscillations of all three flavors of neutrinos in solar neutrino, T2K, and other experiments.
- It is hoped that learning about the properties of neutrinos will bring us closer to solving the mystery of how the Universe came to be made only of matter, instead of equal amounts of matter and antimatter that should have existed when the Universe first came into being.

KAKENHI financial support

"Study of atmospheric neutrinos" (from fiscal 1995, Scientific Research (C)), etc.

Funding by KAKENHI began in the 1990s



Inside of Super-Kamiokande

Photo:
Institute for Cosmic Ray Research, The University of Tokyo
Kamioka Observatory



© (R) The Nobel Foundation.
Photo: Lovisa Engblom.

The Nobel Prize in Physics was awarded in 2015 to Prof. KAJITA and Prof. Arthur B. McDonald "for the discovery of neutrino oscillations, which shows that neutrinos have mass."



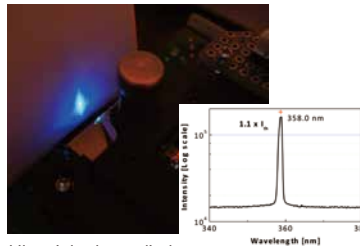
New technology to boost the output power of visible and ultraviolet Light-Emitting Diodes (LEDs)

AMANO Hiroshi, Professor,
Nagoya University

Having a higher efficiency than incandescent or fluorescent lamp, LED lamps are rapidly finding wider use. With earlier device designs, however, light extraction efficiency was too low, requiring development of technology to extract the light more efficiently. Moreover, compared with visible light LEDs, the efficiency of ultraviolet LEDs was extremely low.

Research Outcome

It was discovered that, by forming surface irregularities shorter than the wavelength of the light, the overall reflection of light could be suppressed, enabling the light to extract the device. Using low-energy electron beams, a moth-eye structure was created of regularly arranged cone-shaped structures 500 nm wide. The resulting LED achieved 1.7 to 2.5 times higher light output compared with conventional LEDs. Growing crystals at higher temperatures improved the internal quantum efficiency of the emitting layers of ultraviolet LEDs.



Ultraviolet laser diode

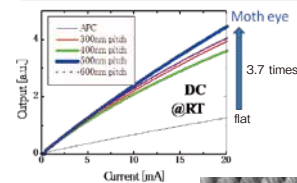
Further developments from research achievements

The technology is applicable to white LEDs and a wide range of other LED products requiring high efficiency and output. Ultraviolet LEDs are also thought to be the key for a variety of environmental friendly products, including those for cleaning air and water. They may also have medical applications such as for treatment of skin diseases.

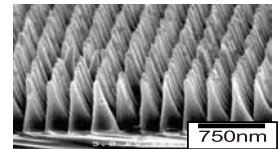
KAKENHI financial support

"Study of a high-performance GaN-based blue LED" (from fiscal 1987, Developmental Scientific Research; Principal Investigator Dr. AKASAKI Isamu)

Funding by Kakenhi began in the late 1980s



Improvement in blue LED light output



Example of moth-eye structure

Dr. AMANO, Dr. AKASAKI Isamu of Meijo University, and Dr. NAKAMURA Shuji of the University of California Santa Barbara, were awarded the 2014 Nobel Prize in Physics for their development of blue LEDs.



© The Nobel Foundation. Photo: Lovisa Engblom.



Studies on the political culture of the Frankish Kingdom under the Carolingians

KIKUCHI Shigeto, Associate Professor,
The University of Tokyo

How was political order established and maintained? While there had been progress in research on the reorganization of norms, such as laws, and systems of the Frankish Kingdom in the 8th and 9th centuries, conditions and modes of governing practices remained to be uncovered as a research question.

Research Outcome

- Dr KIKUCHI proved that fixed expressions in legal documents issued by the royal authority to grant and guarantee rights, such as phrases that were previously considered as "formulaic" substitution of royal "we", could also be given the actual function of representing authority.
- Through exhaustive research, he identified a mechanism that influential figures across the kingdom participated in central political decision-making along with the king, returned to their land as the king's representatives, and locally conveyed and implemented those decisions as the king's will or orders, while fulfilling their responsibility for giving their own consent to such decisions.
- Dr KIKUCHI conducted joint international research and uncovered the purposes and uses of manuscripts, which people across the kingdom created by independently collecting and compiling laws and texts that recorded those decisions.



Diploma of Louis the Pious
(<https://www.e-chartae.ch/de/charters/view/567>)



Manuscript of a compilation of legal and royal decree texts created around the mid-9th century
(<https://gallica.bnf.fr/ark:/12148/btv1b10000504b/f222>)

KAKENHI financial support

The formation and transformation of European legal culture(s): Contextualizing normative sources from the Frankish period (5th-10th century)
(Fund for the Promotion of Joint International Research (Fostering Joint International Research (B)), 2019-2023), etc.

Funding by KAKENHI began in 2014

Further developments from research achievements

Continued research on the creation, maintenance, and restoration of political and social order led Dr KIKUCHI to focus on acts of "exchange" as a means to resolve conflicts in early medieval Europe. With the new KAKENHI funding since 2024, he conducts research on conditions, modes and manners regarding exchanges of goods, people, information, and others as well as on their political and social functions, while keeping an eye not only on the inside of the Frankish Kingdom, but also on settings of diplomatic negotiations.



In July 2024, Dr KIKUCHI received the 114th Imperial Prize and Japan Academy Prize for his book released in 2021, *Herrschaft, Delegation und Kommunikation in der Karolingerzeit. Untersuchungen zu den Missi dominici (751-888)*.



Study on quantum many-body systems

OGATA Yoshiko,
Professor, Kyoto University

In the field of physics, symmetry-protected phases, topological phases, and other new types of phases of matter have been discovered. The "classification problem," in which the states of matter are grouped by "whether they can transition into each other through certain natural transformations," has attracted interest.

It has been said that, in phases protected by symmetry in one or two spatial dimensions, a mathematical structure called a group cohomology serves as the invariant for this classification problem, while in topological phases of two-dimensional quantum spin systems, low-energy excitations called anyons do so.

Invariants must satisfy the following two conditions: (1) these group cohomologies or anyons must be defined in a general setting; and (2) it must be demonstrated in a mathematically rigorous manner that they remain unchanged under "natural transformations." However, analyses up until then had focused on specific models or model groups, and thus did not establish invariants as in the original sense of the term.

Research Outcome

Using a framework of quantum statistical mechanics based on the operator algebra theory enabled mathematically rigorous definition and analysis of invariants in a general setting.

KAKENHI financial support

Study on gapped ground states in quantum spin systems
(Grant-in-Aid for Scientific Research (C), 2019 onward), etc.

Funding by KAKENHI began in the late 2000s

Further developments from research achievements

- Kitaev-Kong predicted a non-trivial correspondence between anyons when there is and when there is not a boundary in a topological phase in two spatial dimensions. Professor OGATA realized this in the framework of anyons in operator algebras.
- While she previously analyzed closed physical systems, she has embarked on analysis on phases of matter in open systems. Thus far, Professor OGATA has revealed how the structure of anyons can change when a system interacts with its environment.

Professor OGATA received the Awards for Science and Technology (Research Category) of the FY2024 Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology for her study on quantum spin systems.



Proteomic study on archaeological and ecological materials

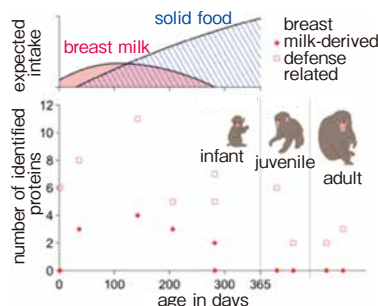
TSUTAYA Takumi,
The Graduate University for Advanced Studies,
SOKENDAI, Assistant Professor

Mass spectrometry-based proteomics has produced remarkable results in the fields of medical science and molecular biology; however, it has rarely been used for archaeological and ecological samples obtained from the field.

Research Outcome

Assistant Professor TSUTAYA is a pioneer in applying the techniques of "palaeoproteomics," which has been in use overseas since the 2010s, to ecological and archaeological research in Japan. He also developed a new method of analysis on complex, degraded proteomes, which are obtained from ancient human skeletons or feces of extant primates.

Assistant Professor TSUTAYA demonstrated that it is possible to reveal facts about behavioral or physiological aspects of life phenomena - which DNA analysis cannot unveil - that cannot be directly observed or have become a part of the past.



Weaning patterns, etc. can be accurately reconstructed from several proteins contained in feces.



Denisovan mandible discovered in Taiwan

KAKENHI financial support

Health checkup of wild orangutans by fecal metagenomics and metaproteomics
(Fund for the Promotion of Joint International Research (Fostering Joint International Research (B)), 2022 onward), etc.

Funding by KAKENHI began in 2019

Further developments from research achievements

- Applying a proteomic method to archaeological and ecological materials that are not in an ideal condition has made it possible to address important questions on human evolution and ecology from a new perspective.
- This study led to major breakthroughs such as the discovery of a male Denisovan mandible from Pleistocene Taiwan.
- Assistant Professor TSUTAYA advances research activities regarding the reconstruction of life histories of wild animals as well as the analysis on protein distributed in the environment, with the ultimate goals of biodiversity conservation and paleoenvironmental reconstruction.



Assistant Professor TSUTAYA received the Young Scientists' Award of the FY2024 Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology for his study on the evolution of human breastfeeding and weaning.

Other publications of research results can also be found in KAKEN (P26), Research Result Topics (P29) and Abstracts of Large-scale Research Projects (P30).

Research Results Topics

https://www.jsps.go.jp/j-grantsinaid/37_topics/
(Japanese version only)



KAKEN(National Institute of Informatics)
<https://kaken.nii.ac.jp/en/>



Abstracts of Large-scale Research Projects
<https://www.jsps.go.jp/english/e-grants/lsrcp/>



Furthermore, we implement an initiative called "HIRAMEKI☆TOKIMEKI SCIENCE" to share the fun and fascination of science with 5th and 6th graders in elementary school, middle and high school students.

Through this program, they can visit research labs at universities and other institutions across Japan and learn firsthand about cutting-edge research embodied in projects funded by KAKENHI. Since its launch in FY 2005, the program has attracted approx. 88,000 students.

We also welcome participation of teachers, parents and other family members of participating students.

HIRAMEKI☆TOKIMEKI SCIENCE
<https://www.jsps.go.jp/j-hirameki/>
(Japanese version only)



■ Scenes from HIRAMEKI☆TOKIMEKI SCIENCE



August 11, 2024 Hokkaido University

Let's make tiny landscapes with drones!
- Look, touch, imagine the shapes of the Earth

HAYAKAWA Yuichi (Associate Professor, Faculty of Environmental Earth Science)



August 2, 2024 Shibaura Institute of Technology

Welcome to the world of ultrahigh pressure
- hot ice, liquid dry ice, and artificial diamonds

YAMAMOTO Ayako (Professor, College of Engineering)



November 23, 2024 Kyoto City University of Arts

Diversity in terms of the function of "memory"
-Exploring from the Experiments of Psychology.

HOTTA Chie (Associate Professor, Faculty of Fine Arts)



August 7, 2024 Chugoku Gakuen University

The World of Bacteria You Never Knew
- Take a look at the bacteria that make food!

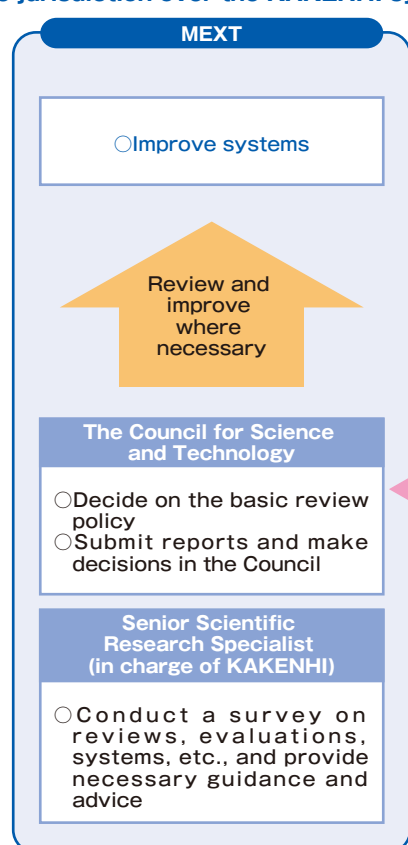
KUSUMOTO Akiko (Associate Professor, Faculty of Contemporary Life Sciences)

Supplementary Material and Data

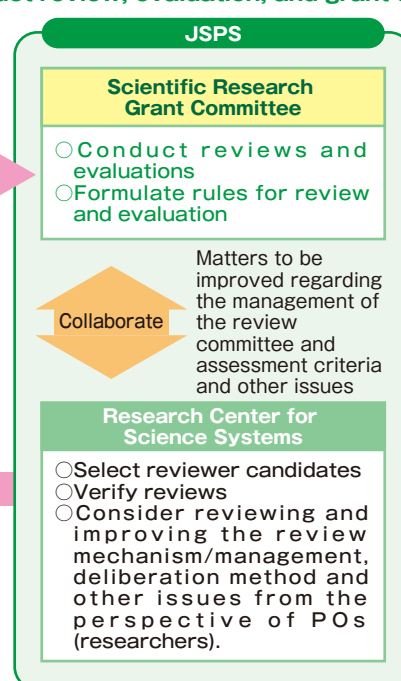
Management of the KAKENHI System

MEXT and JSPS operate the KAKENHI program under their cooperation and collaboration. While MEXT decides the basic policy of the program, JSPS conducts reviews in many research categories and grants all research funds. Sections under the Science Subdivision of the Council for Science and Technology as well as the Research Center for Science Systems* are working to improve the system based on the insights of currently active researchers.

Have jurisdiction over the KAKENHI system



Conduct review, evaluation, and grant delivery



*The Center was established in the JSPS in July 2003, mainly based on the "System Reform in Competitive Research Funds" decided by the then Council for Science and Technology Policy. It plays a wide range of roles aimed at establishing an impartial and highly transparent review and evaluation system.

Research Center for Science Systems
<https://www.jsps.go.jp/english/e-center/>

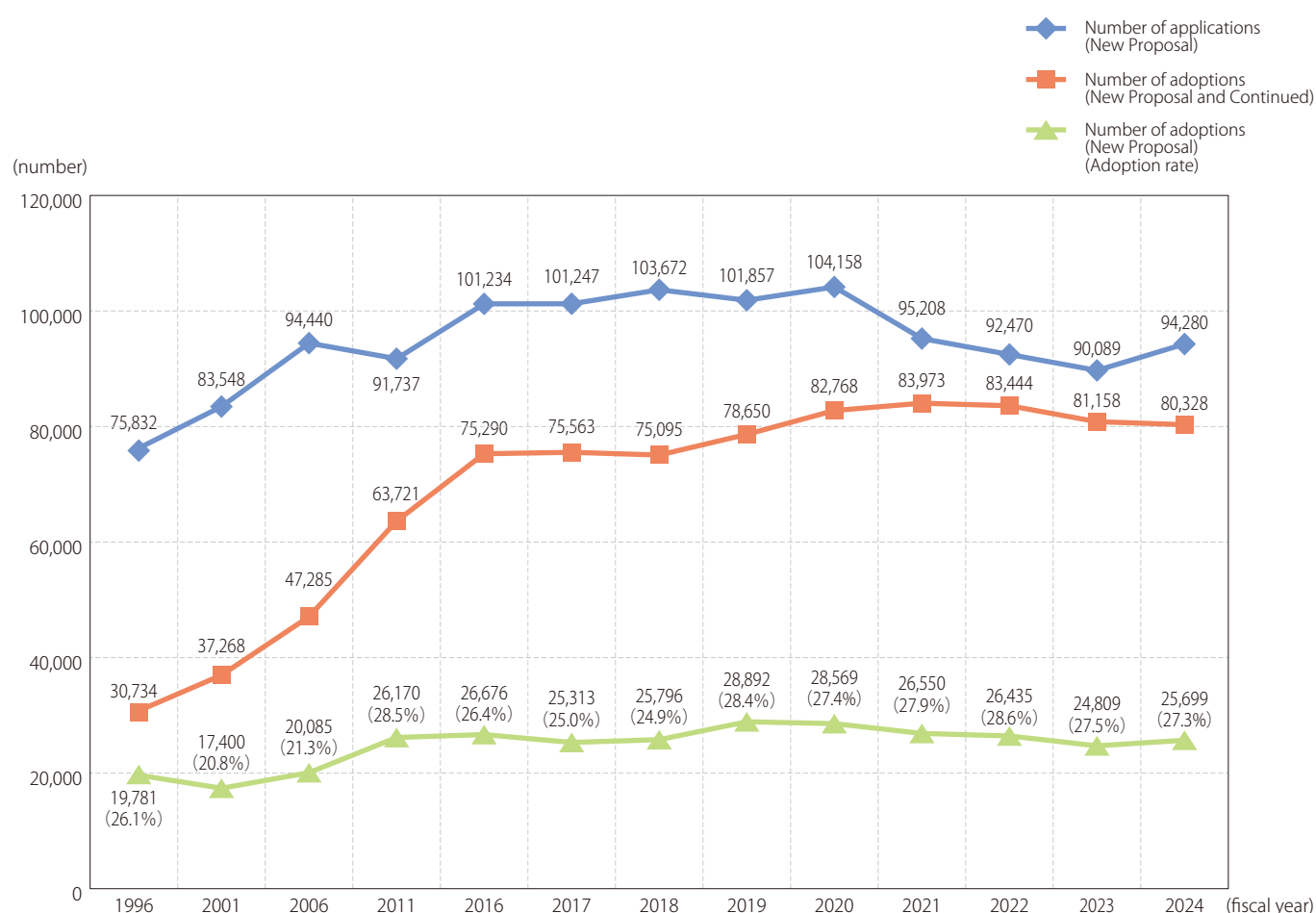


Application/Adoption Numbers and Annual Budgets

Trends in KAKENHI Applications, Adoptions, and Adoption Rate

Although the number of applications for KAKENHI has been on the decrease since fiscal 2021 due to the extension of continued research projects following the COVID-19 pandemic, the number of new applications in fiscal 2024 was 94,280, up 4,191 from the previous fiscal year.

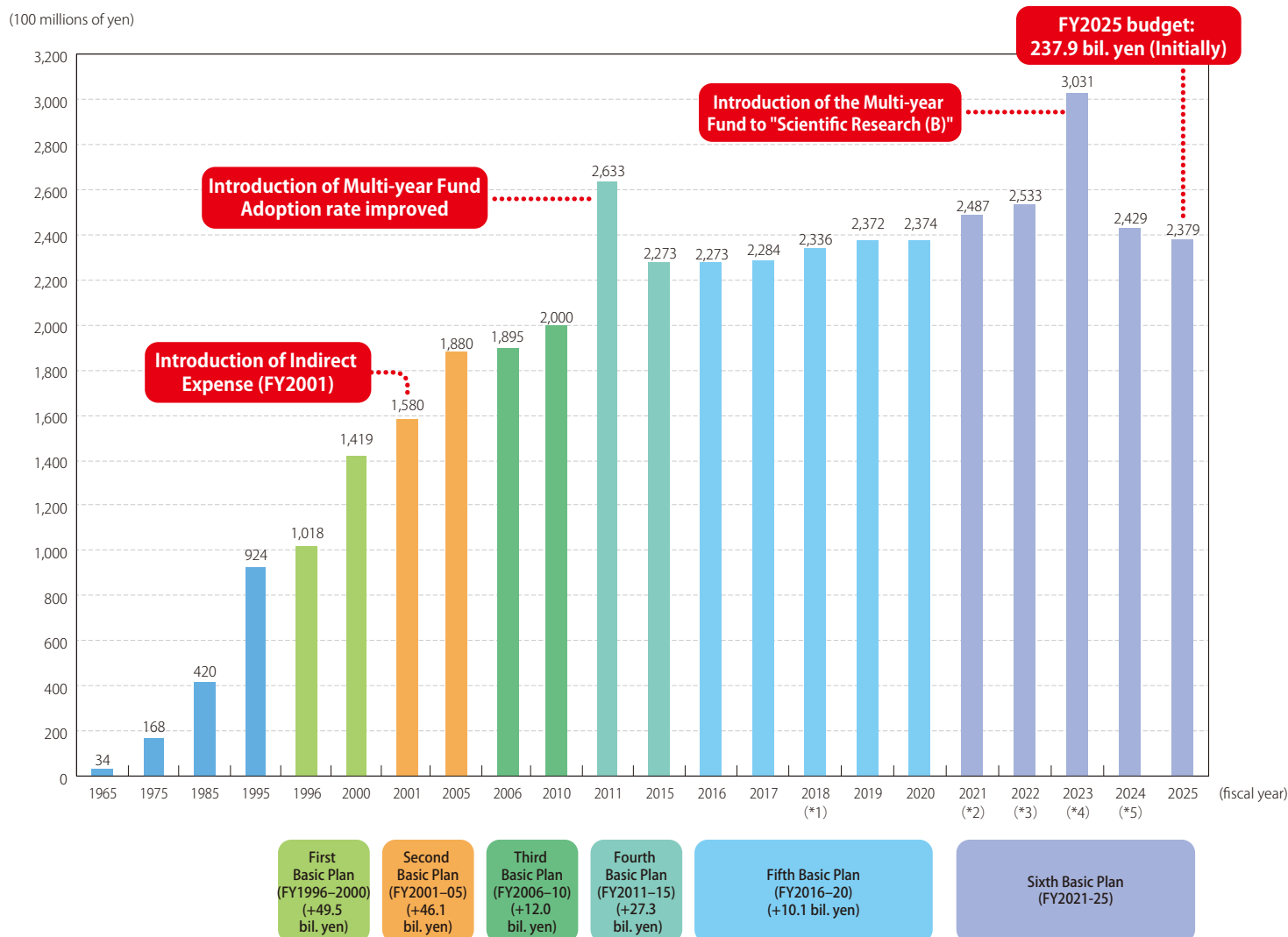
The adoption rate for fiscal 2024 stood at 27.3%, and bringing the total number of adopted projects to 80,328, including ongoing projects.



* Data for main research categories only.

Budget Transition

The amount budgeted for KAKENHI increased significantly during the periods of the First and Second Basic Plans for Science and Technology. However, growth was more gradual in the Third Basic Plan period due to national budgetary constraints. Fiscal 2011 saw a major improvement in the adoption rate, along with the introduction of the Multi-year Fund, which allows the budget to include funds for the entire research period of adopted projects. These changes resulted in an increase in the budget of 63.3 billion yen compared to the previous fiscal year. The initial budget for fiscal 2025 is 237.9 billion yen, up 200 million yen from the initial budget for the previous fiscal year.



- *1 FY2018 budget includes supplementary budget of 5 billion yen
- *2 FY2021 budget includes supplementary budget of 11 billion yen
- *3 FY2022 budget includes supplementary budget of 15.6 billion yen
- *4 FY2023 budget includes supplementary budget of 65.4 billion yen
- *5 FY2024 budget includes supplementary budget of 5.2 billion yen

Review Sections

Review Sections Tailored to Research Categories

The Review Section Table is made up of an “Overview”, “Table for Basic Sections”, and “Table for Medium-sized and Broad Sections”. The overview allows applicants to grasp the overall picture of the review sections. The Basic Sections have been established to take into account the diversity of scientific research and address the varied themes cultivated to date. They comprise research categories which attracted large numbers of applications per research field in the review system that operated up to the 2017 funding year, such as “Scientific Research (B/C)” and “Early-Career Scientists”. The Basic Sections are not rigidly defined, but rather expressed as “-related” so they can flexibly encompass new advancements and diverse expansions in scientific research.

Several Basic Sections are brought together under each Medium-sized Section for use in the “Scientific Research (A)” and “Challenging Research (Pioneering/Exploratory)” research categories. These enable selection of outstanding research proposals in a competitive environment employing a broader scope in line with the aims and character of the research category in question. The content of each Medium-sized Section is not limited by the content of the Basic Sections it contains : applicants need not feel bound by the Basic Sections listed when choosing a Medium-sized Section.

Broad Sections bring together multiple Medium-sized Sections to enable selection of outstanding research proposals in a competitive environment under the “Scientific Research (S)” category.

Applicants should select a review section under which to apply after checking the examples of related research content shown in the “Table for Basic Sections” and “Table for Medium-sized and Broad Sections”.

The Broad Section applies to “Scientific Research (S)”. Applicants for this category select one of the Broad Sections listed, from A through K.

The Medium-sized Section applies to “Scientific Research (A)” and “Challenging Research”. Applicants for these categories select one of the Medium-sized Sections listed.

The Basic Section is the fundamental unit, and used in the “Scientific Research (B/C)” and “Early-Career Scientists”. Applicants for these categories select one of the Basic Sections listed.

Each item of Basic Section offers some examples related research contents. They help applicants understand the concrete contents.

■ The Review Section Table(Overview Excerpt)

Broad Section A	
Medium-sized Section 1:Philosophy, art, and related fields	
Basic Section	
01010	Philosophy and ethics-related
01020	Chinese philosophy, Indian philosophy and Buddhist philosophy-related
01030	Religious studies-related
01040	History of thought-related

■ The Review Section Table(Table for Basic Section Excerpt)

Basic Section	Examples of related research content	Medium-sized Sections and Broad Section corresponding Basic Sections	
		Medium-sized Section	Broad Section
01010	[Philosophy and ethics-related]	1	A
	Philosophy in general, Ethics in general, Western philosophy, Western ethics, Japanese philosophy, Japanese ethics, Applied ethics, etc.		
01020	[Chinese philosophy, Indian philosophy and Buddhist philosophy-related]	1	A
	Chinese philosophy/thought, Indian philosophy/thought, Buddhist philosophy, Bibliography, Philology, etc.		

■ The Review Section Table(Table for Medium-sized and Broad Sections Excerpt)

Broad Section A	
Medium-sized Section 1:Philosophy, art, and related fields	
Basic Section	Examples of related research content
01010	[Philosophy and ethics-related] Philosophy in general, Ethics in general, Western philosophy, Western ethics, Japanese philosophy, Japanese ethics, Applied ethics, etc.
01020	[Chinese philosophy, Indian philosophy and Buddhist philosophy-related] Chinese philosophy/thought, Indian philosophy/thought, Buddhist philosophy, Bibliography, Philology, etc.

Selection of Reviewers (in the case of Scientific Research category)

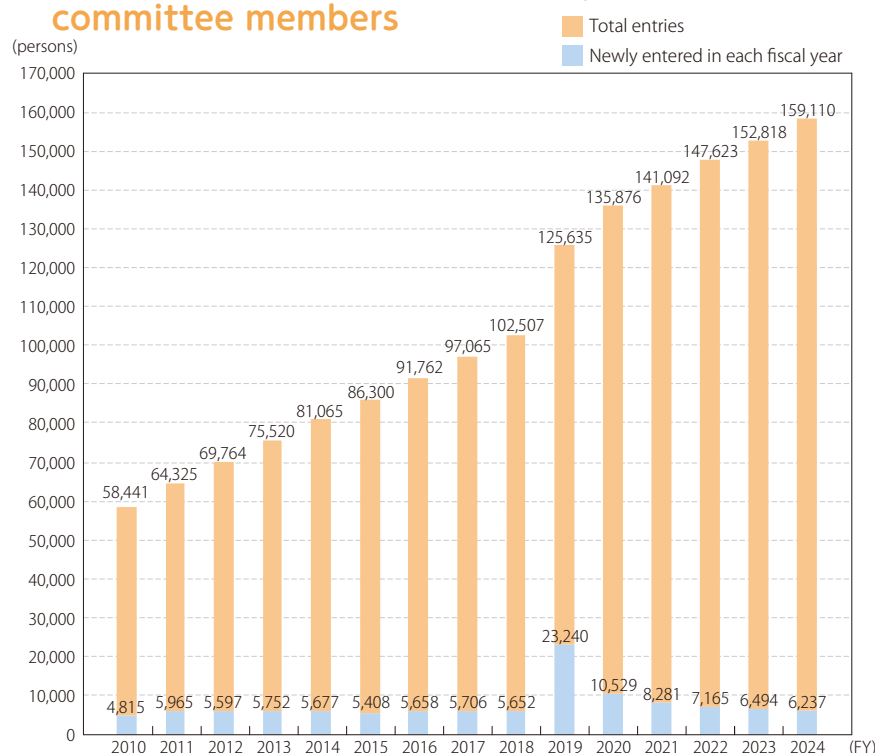
Efforts are made to ensure that reviewers are selected fairly and appropriately, to choose outstanding, high-quality research projects, and to raise the reliability of the KAKENHI review process. Program officers at the Research Center for Science Systems create a list of reviewer candidates from those in the database of potential review committee members. The reviewers are then selected by JSPS.

This database lists KAKENHI Principal Investigators and other potential reviewers, and continues to grow each year. (Number of candidates as of fiscal 2024: approx. 160,000.) To keep the database entries up to date, the researchers themselves are able to check and update their registered information when necessary.

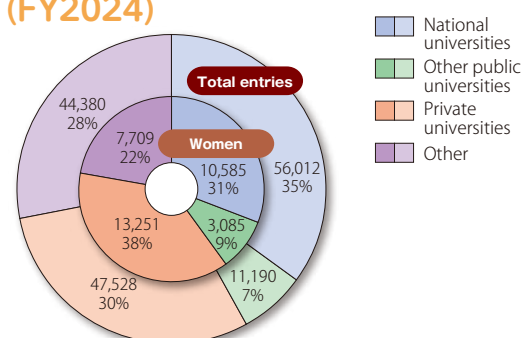
In the Research Center for Science Systems, several program officers in each field are responsible for preparing lists of potential reviewers, based on their discipline, published papers to date, awards received, and other factors. In putting together the list of candidates, the emphasis is on finding persons who are fully conversant in the field, fair, and sufficiently capable of conducting evaluations, while also enabling review to take into account a broad range of viewpoints. Moreover, from the standpoint of allowing for diversity of reviewers, program officers endeavor to make use of women researchers and those from public and private universities, independent administrative agencies, private enterprises and the like, ensuring that reviews are free from any bias in light of applicants' attributes.

In addition, with a view to cultivating the next generation of review committee members, from reviews conducted in fiscal 2019 the database is being expanded to include researchers who have received "Early-Career Scientists" and "Young Scientists (B)", and the assignment of first-time reviewers of a relatively young age (49 and under) is being pursued proactively for reviews in the "Scientific Research (B/C)" and "Early-Career Scientists" categories.

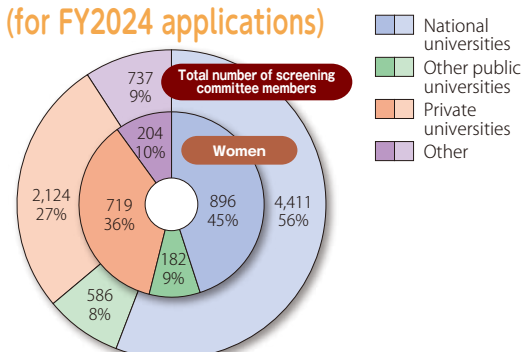
■ Trend in entries in database of potential review committee members



■ Status of database entries (FY2024)



■ Number of review committee members (for FY2024 applications)



Aiming for easy-to-use research grants

You can use research funds for a wide range of purposes, as long as they are necessary for your research. We are making improvements every day to make the funds easier to use.

Based on requests from researchers and research institutions, we are making various improvements of KAKENHI to facilitate the use of research grants.

■ Examples of major system improvements

■ Use of research grants free from the constraints of a single fiscal year system: Introduction of the Multi-year Fund to KAKENHI

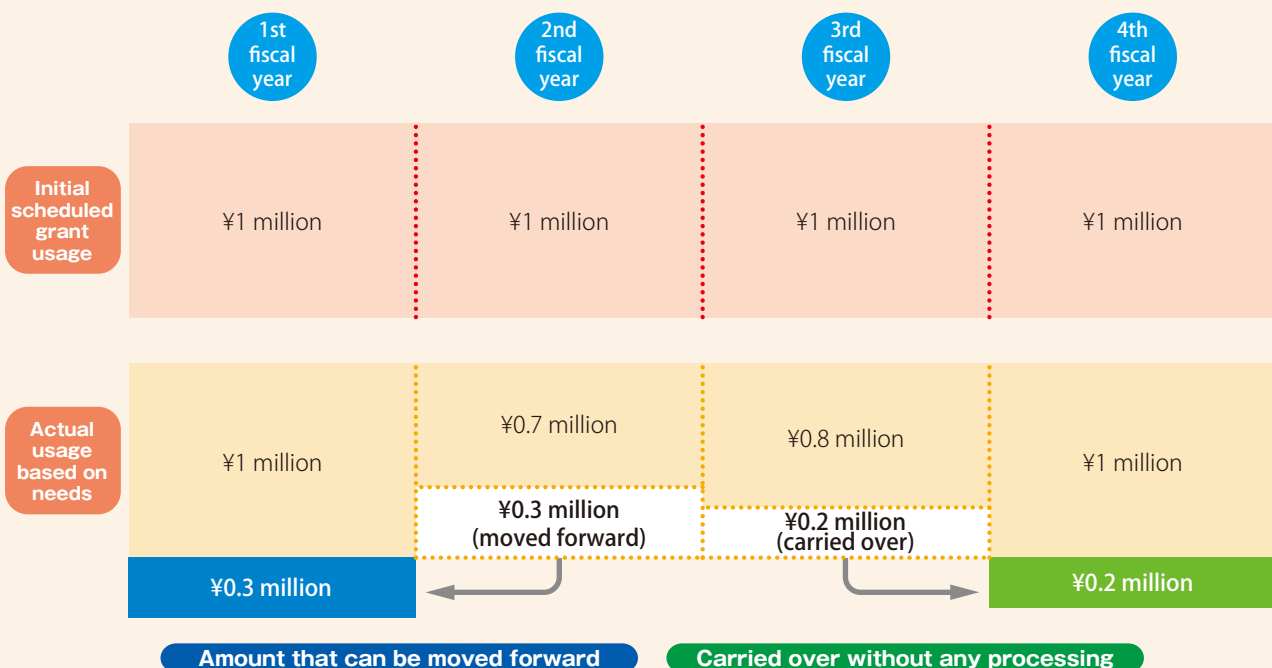
JSPS has established the Multi-year Fund to enable the use of research grants over multiple fiscal years. You can flexibly use research grants for the entire research period of multi-year projects under the research categories eligible for the Multi-Year Fund.

For the eligible research categories, please refer to the research category details on pages 3 to 4.

Advantages of Implementing the Multi-year Fund

- ◆ Flexible use of research grants
 - In pace with the progress of their research projects, researchers can front-load the spending of research funds scheduled to be used in the following fiscal year or later, or spend unused funds in the following fiscal year or later within the funded period.
 - Researchers can enter into multi-year contracts.
 - It is acceptable for goods ordered at the end of one fiscal year to be delivered in the next.
- ◆ No need to request carryover of unused funds
This helps researchers to secure their research time and research institutions to reduce their administrative burden.

■ Image of Multi-year Fund grant usage



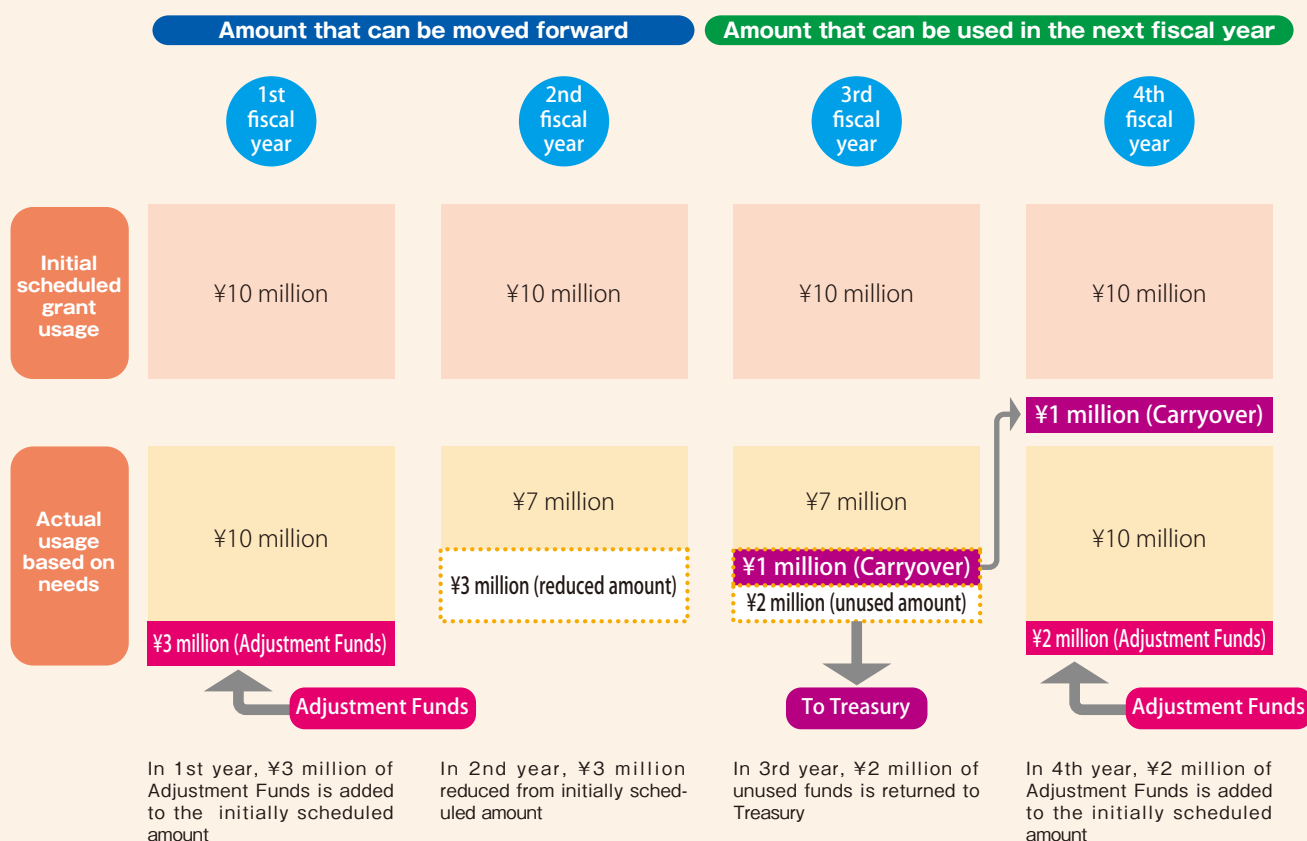
■ "Carryover" system for the Grants-in-Aid for Research

In the event that a research project is not, as opposed to its original schedule, expected to be completed by the end of the fiscal year due to factors that could not be foreseen at the beginning, the funded period may be extended and the grant may be carried over to the following fiscal year through the prescribed procedures.

In addition, if the requirements of the carryover system are not met, an application for use in the next fiscal year may be made through the "Adjustment Funds" system.

■ Adjustment Funds system of KAKENHI (Series of Single-year Grants)

We have introduced the Adjustment Funds system to enable funds in projects under research categories outside the scope of the Multi-year Fund to be brought forward for use or carried over for use in the next fiscal year, thus realizing flexible use of research grants.



■ Extension of research periods in line with interruptions such as maternity/childcare leave and long-term overseas stay

Research can be suspended temporarily when taking leave for maternity, childcare and the like and research periods extended in accordance with their request. And, a system was introduced to enable research to be suspended temporarily during periods of residence outside Japan for research purposes and research periods extended accordingly.

■Purchase of joint-use facilities using funds combined from multiple grants

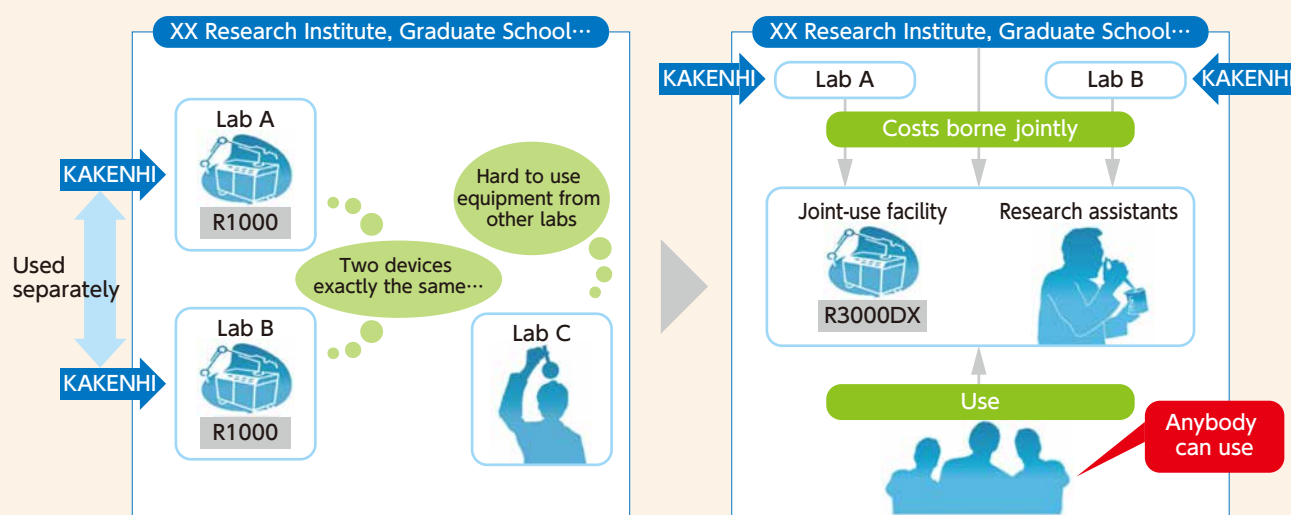
To promote efficient use of KAKENHI grants and joint use of facilities, it has been possible to purchase facilities that are used jointly (joint-use facility) by combining funds from multiple grants. In addition to combining funds across multiple KAKENHI grants, it is also possible to purchase joint-use facilities using KAKENHI funds in combination with funds from other competitive research funds schemes.

For details of schemes that are eligible for combination, please refer to the MEXT website.

Concerning the purchase of joint-use facilities with funds from different research funds (a combined use) (Japanese version only)
https://www.mext.go.jp/content/20200910-mxt_sinkou02-100001873.pdf



Image of combining KAKENHI funds (in the case of joint-use facility)



■Joint use of research facilities and equipment

Researchers are obliged to make efforts to promote joint use with those inside and outside of their research institutions of research facilities and equipment that have been purchased with direct expenses and donated to research institutions and that meet all of the following conditions.

- I. The purchase price is 10 million yen or more;
- II. There are general-purpose properties that can be utilized for other research projects; and
- III. Joint use of the research facility or equipment in question has no risk of interfering with the implementation of the funded project.

■Online application procedures

Applications for KAKENHI grants are accepted online through the electronic application system, rather than on paper, in order to secure research time for researchers and reduce the administrative burden on research institutions.

Initiatives for Ensuring Appropriate Use of KAKENHI Funds and Fair Research Activities

- To prevent any improper grant spending and research misconduct, related to KAKENHI, every effort has been made to increase awareness of the rules, including distribution of handbooks and holding of explanatory meetings. At the same time, each research institution, rather than the individual researcher, is asked to perform the management of KAKENHI grants and various procedures, under an effective management structure in accordance with the “Guidelines on the Management and Audit of Public Research Funds at Research Institutions (Implementation Standards)”.

Through this policy we are working to reduce the burden on researchers while helping to prevent inadvertent rule violations.

KAKENHI Handbook
<https://www.jsps.go.jp/english/e-grants/handbook>



- We have introduced a mechanism in the electronic application system, which requires that before a formal application for grant delivery can be filed, the applicant must not only pledge to use the KAKENHI grant fairly and efficiently and not to commit any research misconduct, but must also complete a checklist of the minimum items necessary regarding the conduct of KAKENHI-funded research.

■Development of Structures and Mechanisms based on the Guidelines on the Management and Audit of Public Research Funds at Research Institutions and Guidelines for Responding to Misconduct in Research

Research institutions are required to comply with the “Guidelines on the Management and Audit of Public Research Funds at Research Institutions” (Decision of the Minister of Education, Culture, Sports, Science and Technology, revised February 1, 2021) and the “Guidelines for Responding to Misconduct in Research” (Decision of the Minister of Education, Culture, Sports, Science and Technology, August 26, 2014). Such institutions are now expected to set up structures and mechanisms in line with these guidelines.

Outline of Initiatives

- Initiatives for preventing misconduct in advance
- Making clear the management responsibilities in the organization
- Supervision and support by the national government

■Measures Taken against Researchers Who Commit Misconduct

Researchers who commit misconduct in KAKENHI projects may be required to return the research funds, as well as being barred from receiving KAKENHI grants for a set time period. Moreover, the nature of such researchers’ misconduct will be made public.

Also researchers who commit misconduct in a project supported by competitive research funds other than KAKENHI (including those administered by other ministries) and are barred from receiving grants under that program for a set time period will also be barred from receiving KAKENHI grants for the same period.

■ Period of KAKENHI suspension “Improper Grant Spending and Fraudulent Grant Acquisition of KAKENHI”

Subject of Measures	Extent of the improper grant spending and Period of KAKENHI suspension
Researchers who committed improper grant spending of KAKENHI and researchers who conspired in such fraudulent act	Misappropriation of KAKENHI for personal gain ; 10 years
	Other than misappropriation of KAKENHI for personal gain { (1) Cases of major seriousness and maliciousness ; 5 years (2) Cases other than (1) and (3) ; 2 to 4 years (3) Cases of minor seriousness and maliciousness ; 1 year
Researchers who acquired KAKENHI by deception or other fraudulent means and researchers who conspired in such acts	5 years
Researchers who were not directly involved in the improper grant spending of KAKENHI, etc., but failed to exercise due care	The upper limit is 2 years and the lower limit is 1 year depending on the degree of the breach of duty by the researchers who have the duty of care as a good manager.

*A “Sharp Reprimand” shall be issued to researchers instead of KAKENHI suspension in the event that the influence on society and the maliciousness of the conduct are judged to be insignificant and the amount of money involved is small.

■ “Research Misconduct”

Subject of Measures			Negative Impacts on Science and on Public at Large Degree of Maliciousness and Period of KAKENHI Suspension
Subject of Research Misconduct	(a) Particularly malicious individual(s) who, for example, had intention of research misconduct from the very beginning of the research		10 years
	(b) Author(s) of paper(s), etc. related to the research in which research misconduct(s) have been identified (other than(a) above)	Responsible author(s) of the paper(s) in question (corresponding author, lead author or other authors bearing equivalent responsibilities)	(determined in accordance with the impact on the progress of the science in the field in question and the social impact, and on the level of maliciousness involved in the acts) ; 3 to 7 years
		Authors(s) of the paper(s) in question other than the responsible author(s) described above	2 to 3 years
	(c) Individual(s) involved who are not the authors of the research paper(s) for which research misconduct(s) are identified		2 to 3 years
	Responsible authors(s) of paper(s), (corresponding author, lead author or other authors bearing equivalent responsibilities) for which research misconduct(s) are identified, but not involved in the alleged research misconduct		(determined in accordance with the impact on the progress of the science in the field in question and the social impact, and on the level of maliciousness involved in the acts) ; 1 to 3 years

Public Release of Research Results

The achievements of research supported with KAKENHI are made widely available to the public through the Grants-in-Aid for Scientific Research Database (KAKEN) in an effort to promote their application in society as well as to deepen the public's understanding of the KAKENHI program.

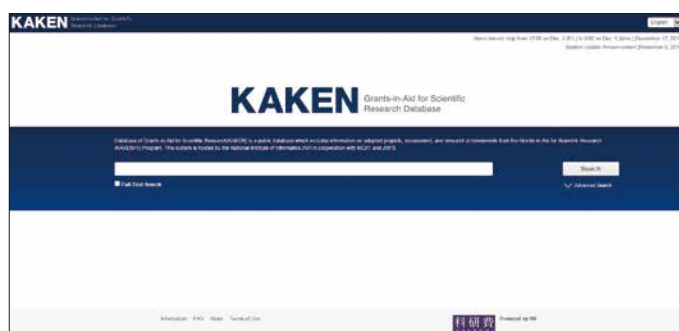
From fiscal 2019 we have been pursuing further enhancements of the information made available on KAKEN, as follows.

- To enable users to see what kind of research is being conducted using KAKENHI from the start of projects (after official grant decisions have been made), outline of the research has been added to information already published in the database such as project title and budget amount.
- In the Report on the Research Achievements published after project completion, we have newly added content explaining the academic and social significance of the research results in simple terms, in addition to the pre-existing specialist explanation of the results. This move both raises researchers' awareness of their accountability, and enables people to know what kinds of research results are generated through the KAKENHI system.

Research using KAKENHI funds should be carried out based on researchers' own self-awareness and responsibility. Therefore the publication on the implementation of the research or research achievements, etc. should not come from the government request and the views and responsibilities on the research achievements should be attributed to the researchers themselves.

About the Grants-in-Aid for Scientific Research Database (KAKEN)

- This database posts information on projects adopted for KAKENHI (from 1965 to date) and summaries of the Report on the Research Results (from 1985 to date).
- Information in the database can be searched by research category, researcher name, discipline, and a variety of other items. The latest research results can therefore be accessed by wide-ranging keyword searches.
- Moreover, DOIs (digital object identifiers) of research papers in journals are published along with other information on research results, making it possible to access published papers directly from KAKEN.



KAKEN(National Institute of Informatics)
<https://kaken.nii.ac.jp/en/index/>



■GRANTS (Integrated Research Project Search)

GRANTS (Integrated Research Project Search) is a service that enables users to perform integrated searches for research projects conducted as part of national government programs for the promotion of research and development and the like, beyond the boundaries of any single program or implementing institution. The service came into operation in the 2021 fiscal year. Its search functions currently cover data held in both the Grants-in-Aid for Scientific Research Database (KAKEN) and the JST Project Database.

GRANTS (Integrated Research Project Search)
<https://grants.jst.go.jp/>
(Japanese version only)



■Acknowledgements and Financial Support for Publishing Research Achievements

Researchers are asked to acknowledge the KAKENHI program when reporting their research achievements in papers, conferences, and other forms.

The program also allows researchers to use direct expense to cover the cost for publicizing their research results widely to the public.

■Open Science Initiatives in KAKENHI

Open science initiatives, including open access (OA) of research papers and data, which promote the sharing and publication of research results and encourage the acceleration of research and the creation of new knowledge, have gained momentum worldwide.

In line with government policies, starting from new KAKENHI calls for proposals in April 2025 and beyond, JSPS requires the publication of academic papers and supporting data on institutional repositories and other information infrastructure immediately after they are published in academic journals. JSPS also promotes proper management and use of research data, and the research data reported as the achievements of KAKENHI-funded projects have been published on KAKEN since fiscal 2025.

The JSPS Policy for Implementing Open Access to Research Papers
https://www.jsps.go.jp/file/storage/open_science/policy_open_access.pdf



Basic Policy for the Handling of Research Data in JSPS Programs
https://www.jsps.go.jp/file/storage/open_science/basic_policy_research_data.pdf



Information Dissemination and Public Relations Activities

Please view the following webpages and web contents for various information on the KAKENHI program

■KAKENHI Websites

1. MEXT provides information like the following, mainly on the research categories for which MEXT performs review and assessment, on its KAKENHI website
 - Application Procedures, Research Proposal Document form
 - Regulations on assessment in funding of scientific research
 - List of reviewers
 - Profiles of research in “Scientific Research on Innovative Areas (Research in a proposed research area)” and “Transformative Research Areas (A/B)”
 - Overview of review for “Scientific Research on Innovative Areas (Research in a proposed research area)”, “Transformative Research Areas (A/B)” and validation results
 - KAKENHI funding results
 - Reports by the Subdivision on Grants-in-Aid for Research, and Research Grant Screening Section of the Academic Deliberation in the Subdivision on Science, Council for Science and Technology

Grants-in-Aid for Scientific Research (KAKENHI) (MEXT)
https://www.mext.go.jp/a_menu/shinkou/hojyo/main5_a5.htm
 (Japanese version only)



2. JSPS provides information like the following, mainly concerned with the research categories for which JSPS performs review and assessment, on its KAKENHI website
 - Application Procedures, Research Proposal Document form
 - Rules Concerning the Review and Assessment for Grants-in-Aid for Scientific Research
 - JSPS rules on the use of funds (for research institutions and for researchers)
 - KAKENHI Handbooks (for research institutions and for researchers)
 - List of reviewers
 - Summary of KAKENHI review
 - Information on electronic application
 - FAQ

Grants-in-Aid for Scientific Research (KAKENHI) (JSPS)
<https://www.jsps.go.jp/english/e-grants/>

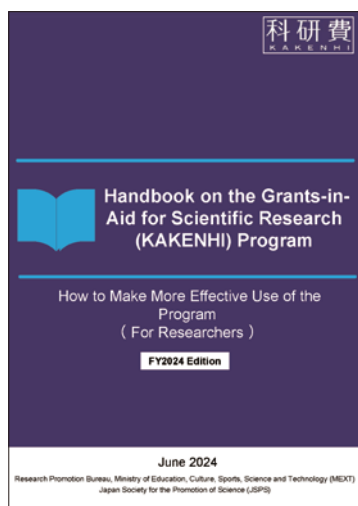


Public relations contents

MEXT and JSPS publish the following contents, which can be downloaded from their websites.

1. “KAKENHI Handbook” (for researchers)

This Handbook, prepared primarily for researchers, provides an easy-to-understand description of the basic contents of the KAKENHI program.



KAKENHI Handbook
<https://www.jsps.go.jp/english/e-grants/handbook>



2. Research Results Topics

Renewed from the previous KAKENHI NEWS in March 2020, this page presents outstanding research results generated through KAKENHI grants in an easy-to-understand way, with content created and provided by researchers and research institutions themselves. We plan to increase the number of articles, allowing even more researchers and research institutions to share the results of their research with greater outreach.

国立研究開発法人 森林研究・整備機構 担当部署連絡先 企画部研究企画科 E-mail: kikaku01@fipri.affrc.go.jp 作成日: 2024年12月25日 更新日: —

最終氷期のシベリアにおける現生人類の拡散と植生変遷 歴史学、考古学、博物館学およびその関連分野

研究者所属・職名: 四国支部 森林生態系変動研究グループ 主任研究員
氏名: 志知 幸治

分野: 先史学、第四紀学 キーワード: 最終氷期、バイカル地域、現生人類、後期旧石器時代、遺跡、花粉分析

課題

- なぜこの研究をおこなったのか? (研究の背景・目的)
現生人類は最終氷期の約5万年前にアジアの北ルートと南ルートに分かれて拡散し、北ルートは西アジアからアルタイ山脈を通り、シベリアのバイカル地域に至ったと考えられている(図1)。バイカル地域の遺跡から出土した石器などの特徴から、4万年前頃には人類が定住していたことが推定されているが、現在よりも寒冷な時代に人類が拡散・定住した要因は明らかにされていなかった。
- 研究するにあたっての苦労や工夫 (研究の手法)
現生人類が拡散および定住した時期を詳細に明らかにするため、バイカル地域の遺跡から出土した骨や歯などの遺物を対象に、放射性炭素年代測定法を用いて遺物の年代分布を調べた。また、拡散・定住した時期の植生や環境を明らかにするため、バイカル湖の湖底から採取した堆積物に含まれる花粉化石の種類と量を調べた。数万年前におよぶ膨大な量の遺物および堆積物の分析が必要であり、かなりの根拠と時間を要した。

図1 氷期のアジアにおける現生人類の拡散ルート

Research Results Topics
https://www.jsps.go.jp/j-grantsinaid/37_topics/
(Japanese version only)



3. Abstracts of Large-scale Research Projects

Includes the titles of newly adopted projects under such categories as “Specially Promoted Research”, “Scientific Research (S)”, “International Leading Research”, and “Transformative Research Areas (A/B)”, along with the names of their principal investigators and summaries of their research content.

[Grant-in-Aid for Specially Promoted Research]

Roles of sea ice in climate change: long-term by Antarctic, and short-term by Arctic



Principal Investigator
Hokkaido University, Institute of Low Temperature Science,
Specially Appointed Professor
Daishima Ken-ichi
Researcher Number : 30185251

Project Information
Project Number : 23H00002
Project Period (FY) : 2025-2029
Keywords : sea ice, deep water circulation, ice-ocean albedo feedback, Arctic research icebreaker, satellite microwave radiometer

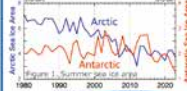
Purpose and Background of the Research

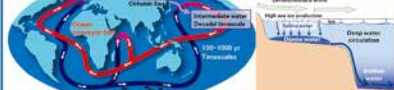
Outline of the Research

Over the past 40 years, the Arctic summer sea ice extent has decreased by half (Figs. 1 & 2). Antarctic sea ice began to decline eight years ago and reached a record low in 2023 (Fig. 1). Sea ice formation releases high-salinity, dense water that sinks and drives deep water circulation (Figs. 3 & 4). This circulation has timescales of decades to millennia and plays a crucial role in long-term climate change due to the ocean's large heat capacity. Around Antarctica, extensive sea ice production generates Antarctic Bottom Water, driving global deep circulation (Fig. 3). Similarly, sea ice formation in the Okhotsk Sea produces dense intermediate water in the North Pacific. Reports from the IPCC suggest weakening of intermediate/deep water circulations, though the causes remain unknown. If the circulations weaken, heat and CO₂ transport could slow down, leading to more extreme climate and accelerated global warming. The dramatic loss of Arctic sea ice has already affected the global climate, but the exact mechanisms driving this decline are still unclear. This research will examine the cause and effects of on-going global sea ice decline.

Q1: Does sea ice variability influence ocean circulation and climate change? We focus on changes in sea ice production in Antarctica and the Okhotsk Sea.

Q2: What is the mechanism of on-going sea ice decline? We focus on the albedo (reflectance to solar radiation) feedback effect between sea ice and open water?






Originality & International Superiority

Method to estimate sea ice production

Our research group has developed a method to estimate sea ice production using satellite microwave data and heat calculations. We were the first in the world to reveal a clear relationship between high sea ice production areas and intermediate/deep water formation regions (Fig. 5).

Launch of the Arctic Icebreaker "Mirai II"

The Arctic research vessel Mirai II will be launched in fiscal year 2026. The region of extreme sea ice decline in the Arctic Ocean is relatively accessible from Japan (Fig. 2), making Mirai II one of the world's most powerful observation platforms for this area.

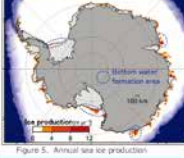


Figure 5: Annual sea ice production

Expected Research Achievements

Research Plan

For Q1: ① By developing algorithms for past satellite microwave data, we will create a global dataset of sea ice production spanning 50 years and clarify its long-term relationship with intermediate/deep water variability. ② High sea ice production in the Okhotsk Sea drives the intermediate overturning of the North Pacific. By resuming ocean monitoring with float observations, we aim to clarify the relationship between the Okhotsk sea ice production and overturning of the North Pacific.

For Q2: ③ As a key mechanism for the rapid decline of Arctic sea ice, ice-ocean albedo feedback, explained in Fig. 6, has been proposed based on satellite data. We will verify this mechanism through direct observations from the icebreaker Mirai II. ④ To investigate two potential factors for Arctic sea ice variability—"wave-ice interactions" and "cloud-aerosol system at the ice edge"—, we will conduct field observations using ice-mounted wave observation buoys and a meteorological drone. ⑤ Regarding Antarctic sea ice variability, we will collaborate with the Japanese Antarctic Research Expedition and conduct observations from the icebreaker Shirase. The research will contribute to understanding and prediction of climate change.

Expected Impact: By incorporating our findings into climate models used in the IPCC, the research will contribute to understanding and prediction of climate change.



Figure 6: Acceleration of sea ice melt by ice-ocean albedo feedback

Homepage: https://www2.isitem.hokudai.ac.jp/news01/vol10ma/index_e.html
Address, etc.: <https://www2.isitem.hokudai.ac.jp/news01/vol10ma/vaken2025/index.html>

Abstracts of Large-scale Research Projects
<https://www.jsps.go.jp/english/e-grants/lsrcp/>





科研費

K A K E N H I

Contact information for KAKENHI:

**Scientific Research Promotion Division,
Research Promotion Bureau, Ministry of Education,
Culture, Sports, Science & Technology**

3-2-2 Kasumigaseki, Chiyoda-ku, Tokyo 100-8959, Japan
Tel: +81-3-5253-4111
(Reception) (ex. 4087, 4094) (Scientific Research Funding, etc.)
URL: https://www.mext.go.jp/a_menu/shinkou/hojyo/main5_a5.htm



**Research Aid Planning Division,
Research Program Department,
Japan Society for the Promotion of Science**

5-3-1 Kojimachi, Chiyoda-ku, Tokyo 102-0083, Japan
Tel: +81-3-3263-0964
URL: <https://www.jsps.go.jp/english/e-grants/index.html>



*The Japan Society for the Promotion of Science welcomes feedback and suggestions regarding KAKENHI.
Please access the online portal shown below.
(URL for feedback and suggestions on KAKENHI:
https://www.jsps.go.jp/j-iken_youbou/index01.html)

